United States Department of Agriculture | Forest Service | Northeastern Area State & Private Forestry | 180 Canfield Street Morgantown, WV 26505-3101

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Subject: 2003 Aerial Ice Storm Damage Sketchmapping Survey

To: Clyde Thompson, Forest Supervisor
Monongahela National Forest

On March 24, 2003, Richard Turcotte and Martin MacKenzie of Forest Health Protection (FHP), Morgantown along with Jane Bard, Diane Stull and Tracy Miles conducted an aerial ice storm damage sketchmapping survey of the Gauley Ranger District and portions of the Marlinton and White Sulphur Springs Ranger Districts. The accompanying map shows the general locations and types of damage observed during this flight.

Meteorological Details of the Ice Storm

The National Weather Service in Charlestown West Virginia labeled this the Valentine's/President's Day Storm of February 15-17, 2003 and reported that this was one of the more unique weather systems to affect the area in many years. The weekend storm featured two main weather systems. The first was a low-pressure system that rode northeastward from the Gulf of Mexico Saturday the 15th and Sunday the 16th. Precipitation rode northeastward across the area from this low…beginning as snow for much of southeast Ohio and northern West Virginia, and as rain to the south. An artic high pressure to the north dug a thin layer of cold air southward…turning rain across central West Virginia and southeastern Ohio to freezing rain and sleet by Sunday morning. Precipitation remained all rain across the coalfields of West Virginia as well as in southeast Ohio, northeast Kentucky, and southwest Virginia.

This precipitation pattern maintained itself for much of the day on Sunday, causing various weather problems. To the south, precipitation fell mostly as rain, with 2 to 5 inches total over the course of the storm. Many counties in this area had small stream flooding problems. To the north, across central West Virginia and southeastern Ohio, major ice accumulations were realized. This was mainly in the form of sleet in the Charleston-Huntington corridor, with a few inches of sleet accumulating. Just to the north, freezing rain was the main mode across Gallia, Mason, and Jackson Counties, with tree damage and power outages from the ice accumulation. Finally, one to two feet of combined snow and ice accumulation was experienced in southeast Ohio and West Virginia north of US-50, with some totals even higher in the mountains.

Complicating matters, Sunday evening the second low-pressure system developed along the Atlantic coast and moved northward. The warm layer became better established Sunday evening, changing over to rain in the central and southern counties of West Virginia and southeast Ohio and adding sleet and freezing rain to the mix in the north. This northern mix helped to compact the snow on the ground and suppress the final accumulation totals. Precipitation tapered off by Monday morning, and during Monday afternoon a final swath of snow moved across on the backside of the coastal low. Overall, this storm will be remembered

for its length (3 days) and for the wide variety of weather problems that it produced.

Classification of Damage

Visual estimates for damage polygons were classified using a four-class system (Table 1). No distinction was made for the type of damage only the amount of damage present in a polygon (e.g. trees uprooted, downed, bent, or broken).

Table 1. Damage classes used for classification of storm damage 15-17 February 2003 storm, Gauley Ranger District of the Monongahela National Forest and intermingled state and private lands

Undamaged	0-9%*
Light	10-33%
Moderate	34-67%
Heavy	≥ 68%

* Estimated percentage of downed and uprooted trees and trees showing branch or bole breakage

Results

Aerial survey identified 3,946 acres of ice storm related damage on the Gauley Ranger District of the Monongahela National Forest. Areas of ice damage (page 5) were scattered throughout the District. The majority of damage was concentrated on ridge tops with top, branch, and bole breakage, uprooted and downed trees. Downed and uprooted trees appeared to be concentrated on slopes along roads, and in riparian areas.

Table 2. Estimates of forest damage caused by 15-17 February 2003 storm, Gauley Ranger District of the Monongahela National Forest, based on aerial survey results

Damage Class	Area affect (acres)	Percent of Area
Undamaged	155,117	98
Light damage (10-33%)*	3,946	2
Total Area	159,063^	100

*Estimated percentage of downed and uprooted trees and trees showing branch or bole breakage

^Area flown including lakes, roads, un-forested areas, etc

Discussion

Although some information on ice storm damage is available in the literature, some of the best comes from the ice storm of 1998; which occurred in the New York and New England area. This ice storm affected 17 million acres of forested land and resulted in a survey of 22,268 individual trees giving us some idea of the potential impacts of ice storm damage. Based on the results of these surveys and studies (Table 3) a damage category crown loss and expected impact on tree survival table was developed.

Table 3. Damage categories based on percent crown loss and expected tree impact based on results from the 1998 ice storm in New York and New England[1].

Damage Category	Crown loss (%)	Impact on tree Survival
No damaged	0	None
Light/moderate	1-49	Survival good
Heavy	50-79	Survival likely, growth affected
Severe	80-100	Survival unlikely

[1] The Northeastern Ice Storm 1998: A Forest Damage Assessment. USDA Forest Service Publication, Durham NH, 32 p.

Results from the New York and New England surveys revealed that between 44-54 percent of the trees in damaged areas were unaffected by the ice storm (Table 4). Although these results are from the northeastern part of region with different trees compositions, topography, and storm pattern it gives us an estimate of the potential impacts. More intensive ground surveys and the use of more quantitative methods will improve the estimates of affected areas and tree damage.

Table 4. Percent of trees sampled within damaged areas with d.b.h. ≥ 5 in each crown loss category from the 1998 ice storm in New York and New England[1].

Crown loss	NY	VT	NH	ME	Region
No damaged	44.7	59.5	49.5	54.2	51.0
Light/moderate	28.4	24.5	27.2	28.8	27.7
Heavy	11.4	7.6	9.3	8.4	9.5
Severe	15.5	8.4	13.5	8.6	11.8

[1] The Northeastern Ice Storm 1998: A Forest Damage Assessment. USDA Forest Service Publication, Durham NH, 32 p.

Recommendations

Aerial surveys provide general information on the location, pattern, and estimated level of damage, and should be used as a starting point for more intensive damage assessments surveys using road surveys, aerial photography, forest plots or transects and standard measurements.

- Conduct road surveys of area when possible using standardized methods, and continue to update and ground truth ice storm damage maps.
- Randomly sample the forest so that quantitative results can be expressed as the proportion of the total forest rather than extremes of specific segments of the forest.
- Quantify the species and size classes of trees damaged.
- Quantify damage based on type of damage, number of trees down, boles broken, crown damage, top broken, etc.

- Contrast the damage in relation to expected mortality rates from previous ice storms.

The Morgantown Field Office can assist in development of a sampling system, damage criteria and analysis: so feel free to contact us. We ask that all field going personnel continue to monitor for the evidence of ice damage in their areas and report this information to the Morgantown Field Office as a ground check to the aerial survey polygons.

I personally would also like to extend my appreciation to Jane, Tracy and Diane for their valuable assistance in this survey. If you or any of your staff have any questions or comments regarding this survey, please contact Richard Turcotte at (304) 285-1544.

Sincerely,

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Forest Health Protection
Enclosures
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